COURSE TITLE: Foundations of Energy

UNIT TITLE: Emerging and New Technologies

SECTION 1: General Information and Overview

Grade Level: 9-12

Suggested Number of Lessons: 5

Suggested Time to Complete Unit: 5 Class periods

Unit Overview: This unit focuses on Emerging and New Technologies of the energy industry. Students will investigate the newest energy resources and technology being used by the industry and will review and expand knowledge of current available energy resources.

SECTION 2: Essential Questions

1.	What are some new emerging energy technologies and how will they impact my future?
2.	What role does hydrogen play in the national transportation portfolio?
3.	What roles do research and development play in new or emerging technologies?

SECTION 3: Major Focus

Technical Content CTE Program of Studies	Learner Activities (Enabling Knowledge and Skills/Processes)	Core Content For Assessment	Academic Expectations
6000 Construction Technology KOSSA Standard AD-002: Demonstrate the ability to learn new processes and steps. **2.1**--Assess the impact of various current and new technologies on the economy.	Using PDF files in the *Emerging and New Technology Unit* , **research** a variety of resources including the *Secondary Info book* http://www.need.org/Energy-Infobooks and the Ocean Energy material from NEED for current trends, new technologies and their impact on the economy for: • hydrogen • ocean • solar • coal	**SC-HS-4.6.1** Students will: • explain the relationships and connections between matter, energy, living systems and the physical environment; • Give examples of conservation of matter and energy. As matter and energy flow through different organizational levels (e.g., cells, organs, organisms, communities) and between	**1.1** Students use reference tools such as dictionaries and computers programs and research tools such as surveys to find the information they need to meet specific demands and solve specific problems.

2.1-2.2--Identify new and emerging technologies.	**Summarize** findings and **give** examples of the impact these trends have on the national energy portfolio and the economy. **Share** findings with class.	living systems and the physical environment, chemical elements are recombined in different ways. Each recombination results in storage and dissipation of energy into the environment as heat. Matter and energy are conserved in each change. **DOK 3**	**2.1** Students will understand scientific ways of thinking and working and use those methods to solve real-life problems.
Construction Technology KOSSA Standard AD-003: Implement new processes given oral instructions. **2.1-2.3--**Engaging in meaningful hands-on, minds-on conceptual based activities in the area of energy technologies. **2.3--**Describe similarities and differences between renewable and nonrenewable sources of energy.	Using the resource files on the *CD (Future is Today),* **develop** a presentation on the new or emerging technologies researched. Information will be assessed in the activity *Mission Possible*. **Listen** to a presentation by the teacher on "*The Future is Today*" in relation to alternative fuels and alternative fuel vehicles. **Complete** the first two columns of KWL worksheet regarding alternative fuels. Supplement #1 **Share** results with class. Using various resources and NEED document, *Transportation Fuels: The Future is Today*, websites and other resources, **research** how the following fuels are used in transportation and the differences and similarities among them: • Petroleum • Gasoline • Diesel • Hybrid Electric • Propane • Ethanol	**SC-HS-4.6.7** Students will: • Explain real world applications of energy using information/data; • Evaluate explanations of mechanical systems using current scientific knowledge about energy. The universe becomes less orderly and less organized over time. Thus the overall effect is that energy is spread out uniformly. For example, in the operation of mechanical systems, the useful energy output is always less than the energy input; the difference appears as heat. **DOK 2**	**5.4** Students use decision making process to make informed decisions among options. **5.1** Students will use critical thinking skills such as analyzing, prioritizing, categorizing, evaluating and comparing to solve a variety of problems in real-life situations.

	• Biodiesel • CNG/LNG • Methanol **Summarize** findings and **identify** differences and similarities of each type of fuel.		
	Compare and **contrast** fuel savings for a Jeep Wrangler and a Civic Honda Hybrid. **Choose** one type of alternative fuel and make presentation to class on that alternative fuel and the alternative uses it has in the transportation industry.		
1.5-6.2--Apply basic concepts of mathematics, science, social studies and communications in the context of energy. **1.16--**Use computer based technologies as related to various concepts of energy.	**Explore** how cost is a major factor in the production and use of the various fuels. **Choose** one type of alternative fuel and **present** to class the findings and the impact this fuel has on current and future economy.		**1.16** Students use computers and other kinds of technology to collect, organize, and communicate information and ideas.
Construction Technology KOSSA Standard EA-005: Display initiative. **5.4--**Students investigate with teacher guidance the role of hydrogen technology in the future.	Using the *NEED resource CD* and the *H2 Educate Kit*, **explore** hydrogen properties and investigate its physical characteristics and interpret findings. **Watch** a demonstration on hydrogen fuel cell car and **identify** the differences between this type fuel and gasoline. **Complete** a survey on hydrogen fuels. Supplement #2	**SC-HS-4.6.7** Students will: • Explain real world applications of energy using information/data; • Evaluate explanations of mechanical systems using current scientific knowledge about energy. The universe becomes less orderly and less organized over time. Thus the overall effect is that energy is	**6.2** Students use what they already know to acquire new knowledge develop new skills or interpret new experiences.

5.5--Demonstrate and develop fundamental skill and knowledge of tools in the industry.	**Review** results of survey and file for comparison at end of unit. **Work** in an assigned group and **complete** an activity on "Hydrogen in Society" depicting its properties and physical characteristics. In the designated role group, **research** questions provided by teacher pertaining to your assigned group (e.g., Hydrogen Distributor, Energy Economist, Environment Scientist, Hydrogen Producer, Energy Security Advisor, Energy Efficiency and Reliability Expert). **Record** information on "Role Group Organizer." Supplement # 3 **Present** findings to class. **Evaluate** presentation using a "Presentation Rubric." **Complete** column three of KWL chart. Supplement # 1	spread out uniformly. For example, in the operation of mechanical systems, the useful energy output is always less than the energy input; the difference appears as heat. **DOK 2**	
	Review and compare before and after results of survey. **Complete** end-of-unit test.	**08-4.6.2** Students will: • Describe or explain energy transfer and energy conservation; • Evaluate alternative solutions to energy problems. Energy can be transferred in many ways, but it can neither be created nor destroyed**.** **DOK 3**	

		SC-HS-4.6.7 Students will: • explain real world applications of energy using information/data; • evaluate explanations of mechanical systems using current scientific knowledge about energy. The universe becomes less orderly and less organized over time. Thus the overall effect is that energy is spread out uniformly. For example, in the operation of mechanical systems, the useful energy output is always less than the energy input; the difference appears as heat. **DOK 2**	

SECTION 4: Culminating Project with Scoring Guide

Students will build a H2 fuel cell car utilizing materials in the H2 Educate Kit.

SCORING GUIDE:

CATEGORY	4	3	2	1
CONTENT	EXTENSIVE- CONTENT BEYOND WHAT IS TAUGHT IN CLASS	GOOD- EXPLANANTION OF CONCEPTS COVERED IN CLASS	BASIC – WHAT HAS ALREADY BEEN COVERED IN CLASS	LIMITED- DOESN'T COVER MATERIAL AS WELL AS DONE IN CLASS
TECHNOLOGY	EXTENSIVE- POWER POINT WITH EXCELLENT ANIMATION AND PICTURES	APPROPRIATE- POWER POINT HAS SOME ANIMATION AND PICTURES	BASIC- POWER POINT WITH LITTLE ANIMATION AND PICTURES	LIMITED – POWER POINT WITH NO ANIMATION OR PICTURES
PRESENTATION	EXCELLENT- FLOWS WELL, AUDIENCE VERY ATTENTIVE- WELL REHEARSED	GOOD – FLOWS WELL PARTICIPANTS KNOW MATERIAL WELL	BASIC – FLOWS UNEVENLY MAY HAVE SOME READING OF NOTES OR SLIDES	LIMITED- PARTICIPANTS READ FROM NOTES OR SLIDES
INTEREST	EXTENSIVE – PARTICIPANTS MAKE MANY EXTENSIONS AND EXPLANATIONS	APPROPRIATE – ENCOURAGES QUESTIONS AND COMMENTS	BASIC – CAN FIELD SOME QUESTIONS	LIMITED – GLAD TO BE THROUGH WITH THE PRESENTATION

SECTION 5: Assessment and Enabling Skills and Processes

Assessment:	PowerPoint presentation, group participation, science notebook, and culminating project. Participate in the *Mission Possible* activity.

SECTION 6: Support Materials (i.e., Resources, Technology, and Equipment)

A. Resources	NEED Materials; Use the reference CD and associated PDF files in the file folder. National Science Standards. Supplement #1--KWL Worksheet. Supplement #2–Hydrogen Survey, and Supplement #3–Role Group Organizer; Use H2 Educate Kit.
B. Technology	Personal and shop tools and equipment; computers, LCD projector
C. Websites (samples of many available)	WWW.NEED.ORG; WWW.DOE.Gov; WWW.EIA.GOV
D. Equipment	NEED H2 Educate Kit